

ESR dating of the Itoigawa-Shizuoka Tectonic Line located at the northeast edge of Japan South Alps

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The Gofukuji fault is a part of the Itoigawa-Shizuoka Tectonic Line (ISTL) Active Fault System (AFS), and its risk of earthquake disaster has risen since the 2011 off the Pacific coast of Tohoku Earthquake (M9.0). According to hypocenter maps in and around Japan South Alps, after the 2011 Earthquake seismic activity has become more active along the Gofukuji fault, while it has hardly been observed along the ISTL-AFS located at the southeast extension of the Gofukuji fault before and after the 2011 Earthquake. More active seismic activity occurs along the north-northwest - south-southeast (NNW-SSE) line, which is an extension direction of the strike of the Gofukuji fault plane, so that in the future large earthquakes may occur along this line rather than the ISTL-AFS (Fukuchi et al., 2016).

Recent studies of fault rocks revealed that the Hoozan fault located at the southeastern extension of the Gofukuji fault may have moved during the Quaternary period (Fukuchi, 2015). As a result of the ESR dating of the Hoozan fault gouge collected from the Ishiutorogawa outcrop, the age (T) of the latest fault movement of the Hoozan fault is estimated as $T < 0.6 \pm 0.1$ Ma, from the hyperfine structure of the Al center in quartz. This result suggests that the ISTL as a geological tectonic line located at the southward extension of the Hoozan fault may be still active during the Quaternary. Thus we carry out ESR dating of the ISTL distributed at the Dondoko-sawa outcrop, Nirasaki city, central Japan. The distribution maps of hypocenters indicate that the seismicity of micro-earthquakes is more active along the ISTL around the Dondoko-sawa outcrop. The X-ray diffraction analysis of fault gouge collected at the Dondoko-sawa outcrop indicates that the black fault gouge on the fault plane contains smectites, which can stably exist below about 110 degree C in natural environments (Yoshimura, 2001). We estimate the formation age of the smectites in the black gouge from the formation depth of smectites by assuming the average geothermal gradient of 3 degree C/100m and the average upheaval rate of 2-3mm/y. As a result, the ISTL around the Dondoko-sawa may have moved between about 1.7-2.5 Ma BP. The ESR dating of the black gouge shows that the age of the latest fault movement is estimated as $T < 0.55 \pm 0.12$ Ma. We conclude that the ISTL around the Dondoko-sawa is still active during the Quaternary period.

References

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